Los Alamos NATIONAL LABORATORY

Space Research at Los Alamos National Laboratory

Illinois Physics Virtual Careers Seminar

Rebecca Holmes Sandoval
Scientist, ISR-2

February 25, 2021

LA-UR-21-21850

Outline

1. Very short history of Los Alamos National Laboratory (2 slides)
2. Very short overview of what LANL does today (3 slides)
3. Space research at LANL
4. Why LANL is a great place to be a postdoc*
5. Why Los Alamos is a great place to live*

* My opinions

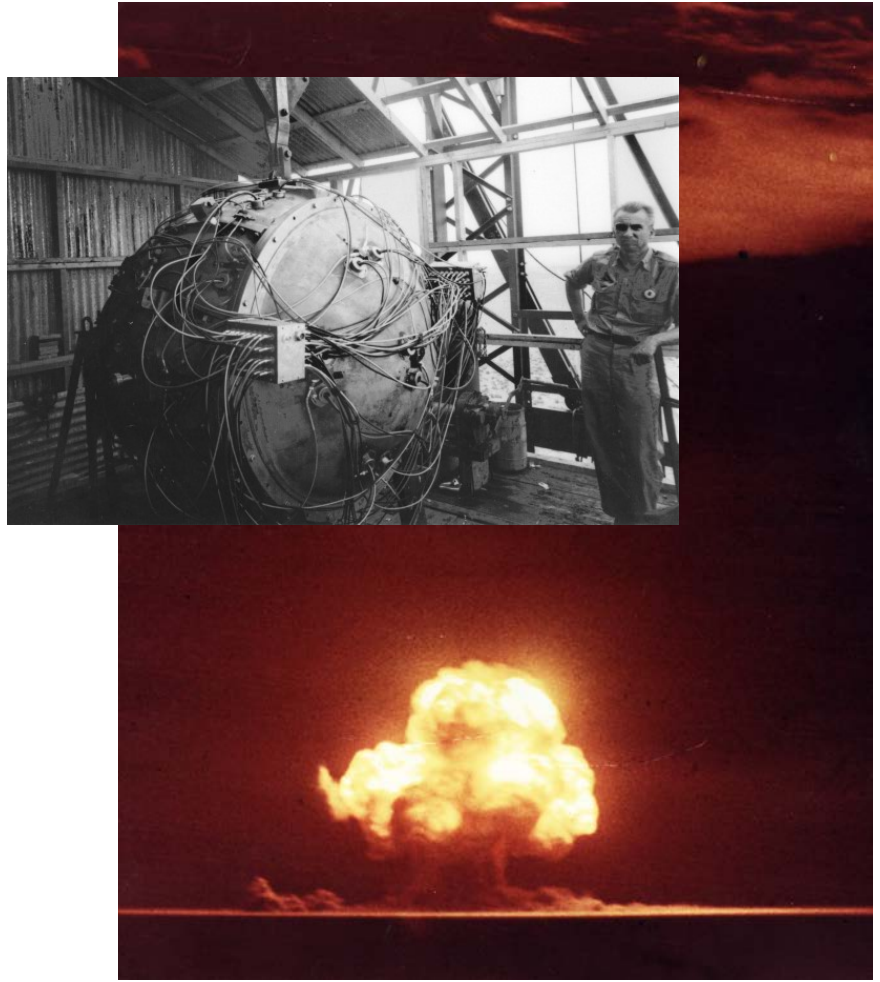
Outline

1. **Very short history of Los Alamos National Laboratory (2 slides)**
2. Very short overview of what LANL does today (3 slides)
3. Space research at LANL
4. Why LANL is a great place to be a postdoc*
5. Why Los Alamos is a great place to live*

* My opinions

The Manhattan Project

- 1938: Nuclear fission discovered
- 1939: WWII begins in Europe
- 1939: Einstein-Szilard letter to FDR
- 1942: Manhattan Project begins
- 1943: Work begins at Los Alamos, NM
- 1945: World's first nuclear test
- 1945: Nuclear weapons used on Hiroshima and Nagasaki



After World War II

- Nuclear testing and research continue at Los Alamos and elsewhere
- Around 1947: Cold War begins
- Stockpiling of nuclear weapons
- 1952: First thermonuclear test
- 1958: Testing moratorium
- 1963: Limited Test Ban Treaty
- 1992: Last US nuclear test

Outline

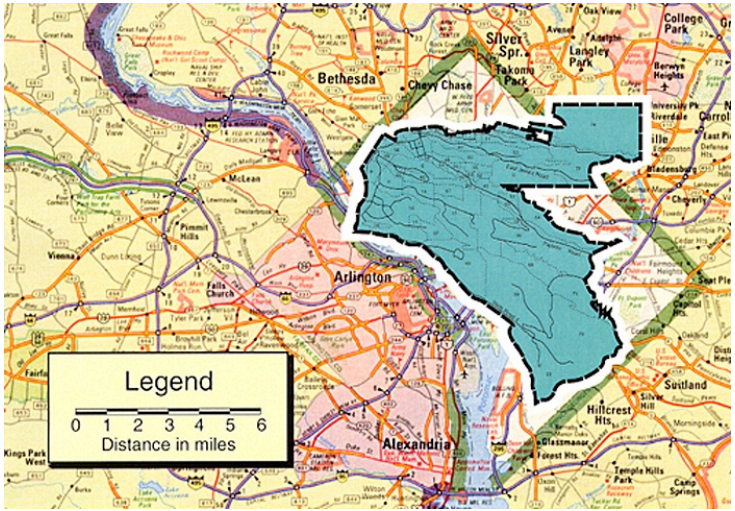
1. Very short history of Los Alamos National Laboratory (2 slides)
2. **Very short overview of what LANL does today (3 slides)**
3. Space research at LANL
4. Why LANL is a great place to be a postdoc*
5. Why Los Alamos is a great place to live*

* My opinions

LANL today

Aerial view of Los Alamos and LANL

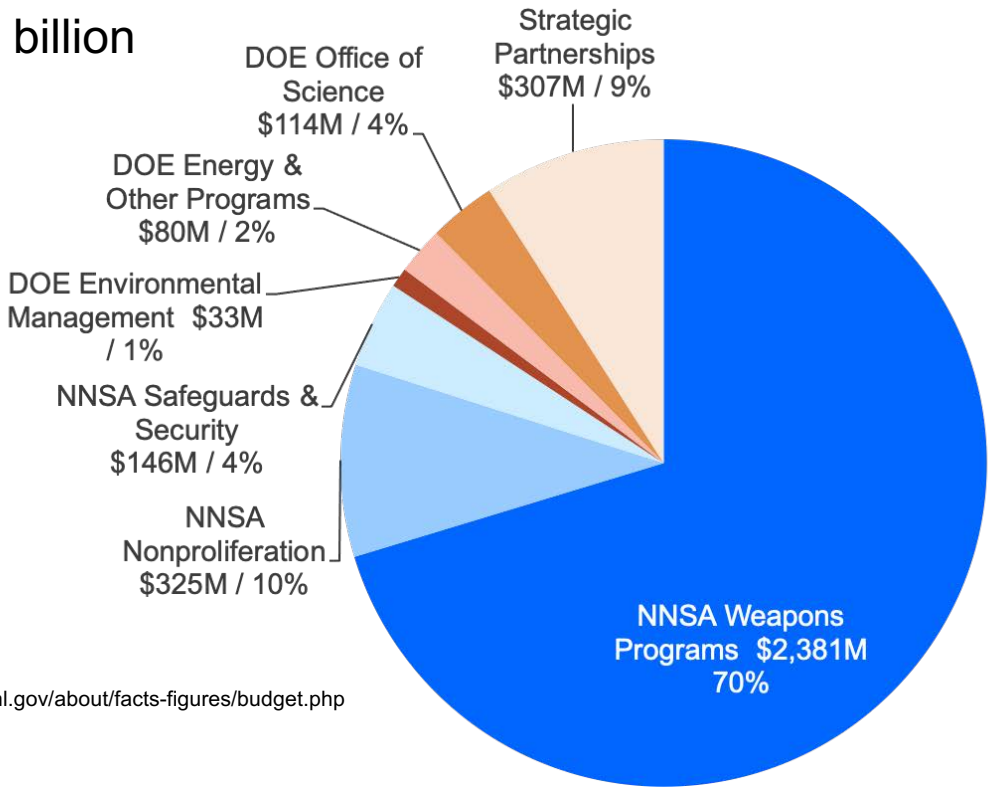
46 square miles **2,436** buildings



LANL land area compared to Washington, DC

LANL budget

Total: $3.4 billion



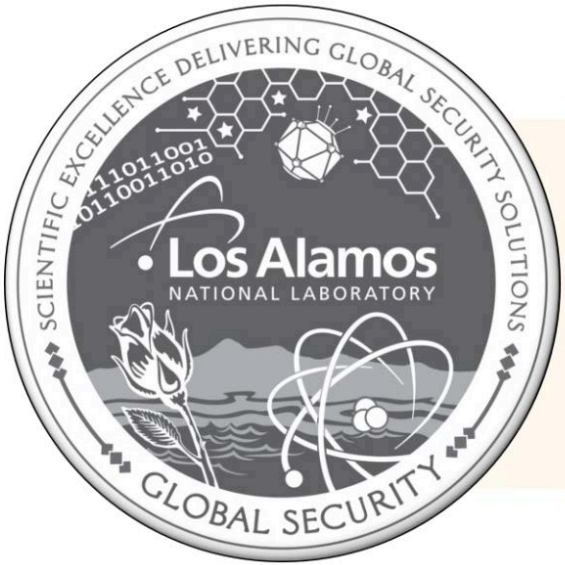
https://www.lanl.gov/about/facts-figures/budget.php

Photos: LANL Flickr

Plutonium manufacturing

Stockpile stewardship

Global Security at LANL



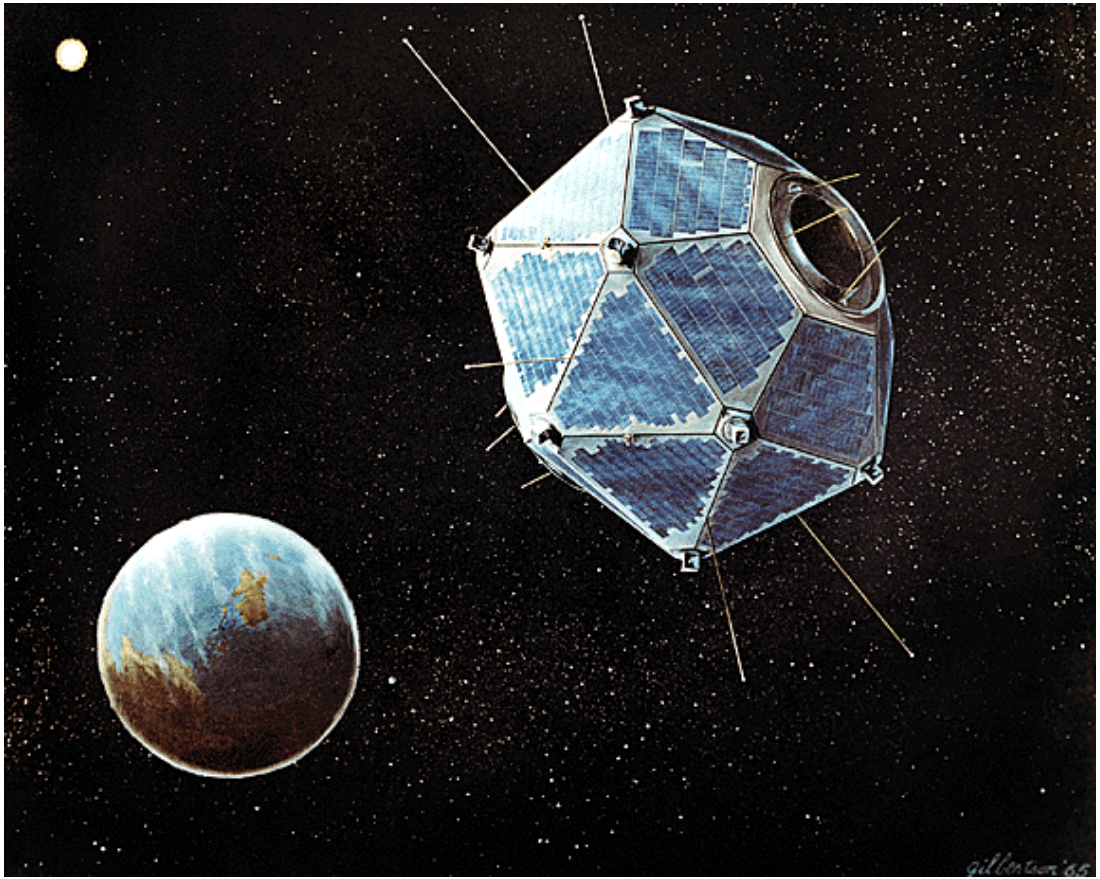
- Provide scientific and technical expertise for the U.S. government
- Nuclear nonproliferation
- Nuclear counterproliferation
- Counterterrorism
- Emerging threats including cyber and space

Outline

1. Very short history of Los Alamos National Laboratory (2 slides)
2. Very short overview of what LANL does today (3 slides)
3. **Space research at LANL**
4. Why LANL is a great place to be a postdoc*
5. Why Los Alamos is a great place to live*

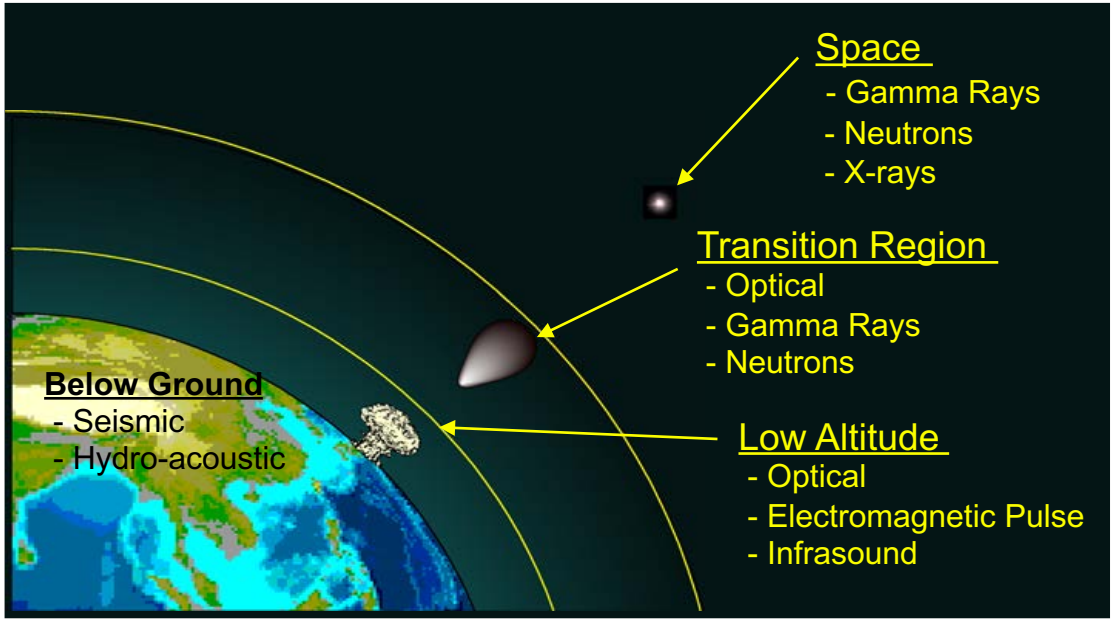
* My opinions


ISR
Intelligence and Space Research
Los Alamos National Laboratory
From Space, In the Air, On the Ground

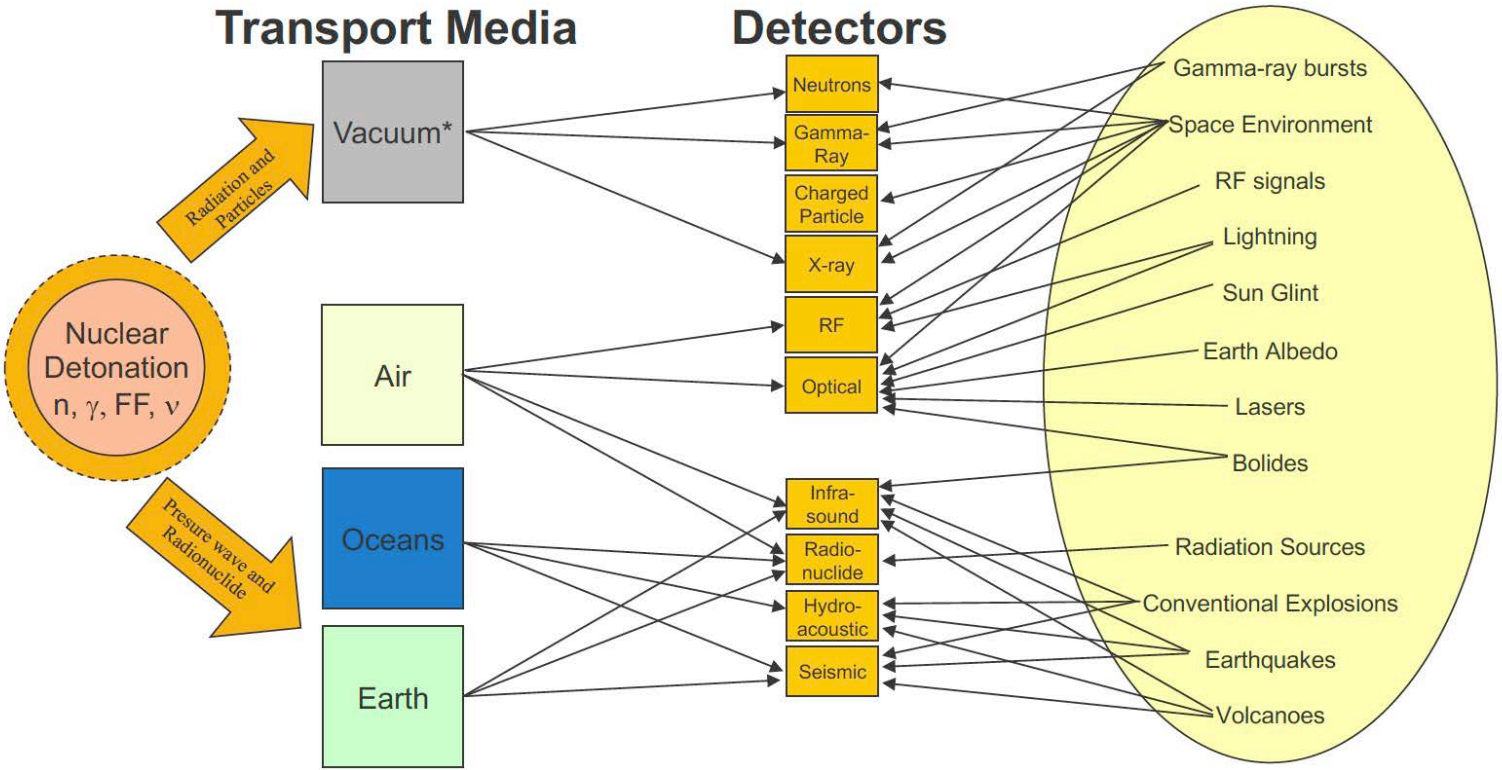


Detecting nuclear explosions

- Did it happen?
- Was it nuclear?
- Where was it?
- How big was it?

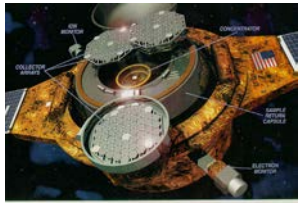


Detecting nuclear explosions



NASA space science missions

NACHOS



Van Allen Probes

Interstellar Boundary Explorer IBEX

CASSINI MISSION TO SATURN

iMAP INTERSTELLAR MAPPING AND ACCELERATION PROBE

CURIOSITY MARS SCIENCE LABORATORY

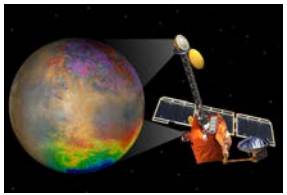
Los Alamos Aerospace SwRI MWU U of Bonn NASA GSFC APL USC TWINS

Exploring the Sun-Earth Connection IMAGER FOR MAGNETOPAUSE TO AURORA GLOBAL EXPLORATION IMAGE

Swift

NEW MILLENNIUM DEEP SPACE FLIGHT #1

ACE

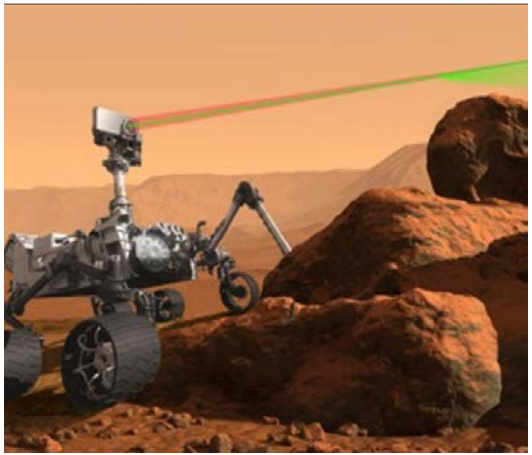


HETE-2

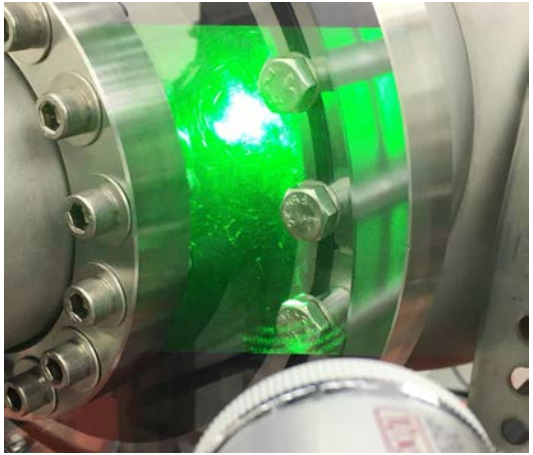
Perseverance rover landing on Mars – February 18, 2021

SuperCam

Laser Remote Sensing + Imaging, IR Spectra & Sound

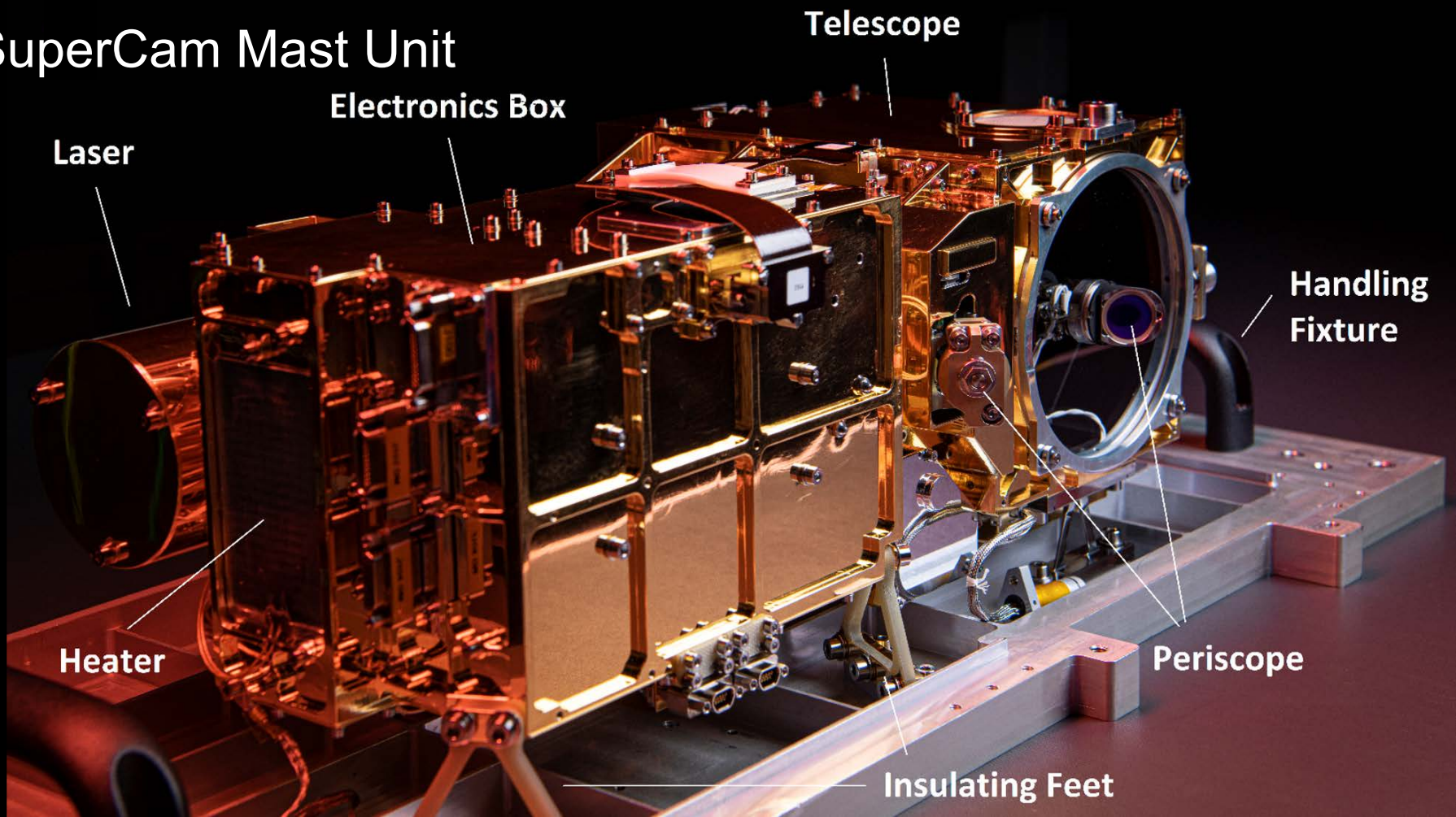


Laser plasma ⟶ atomic emission (LIBS)

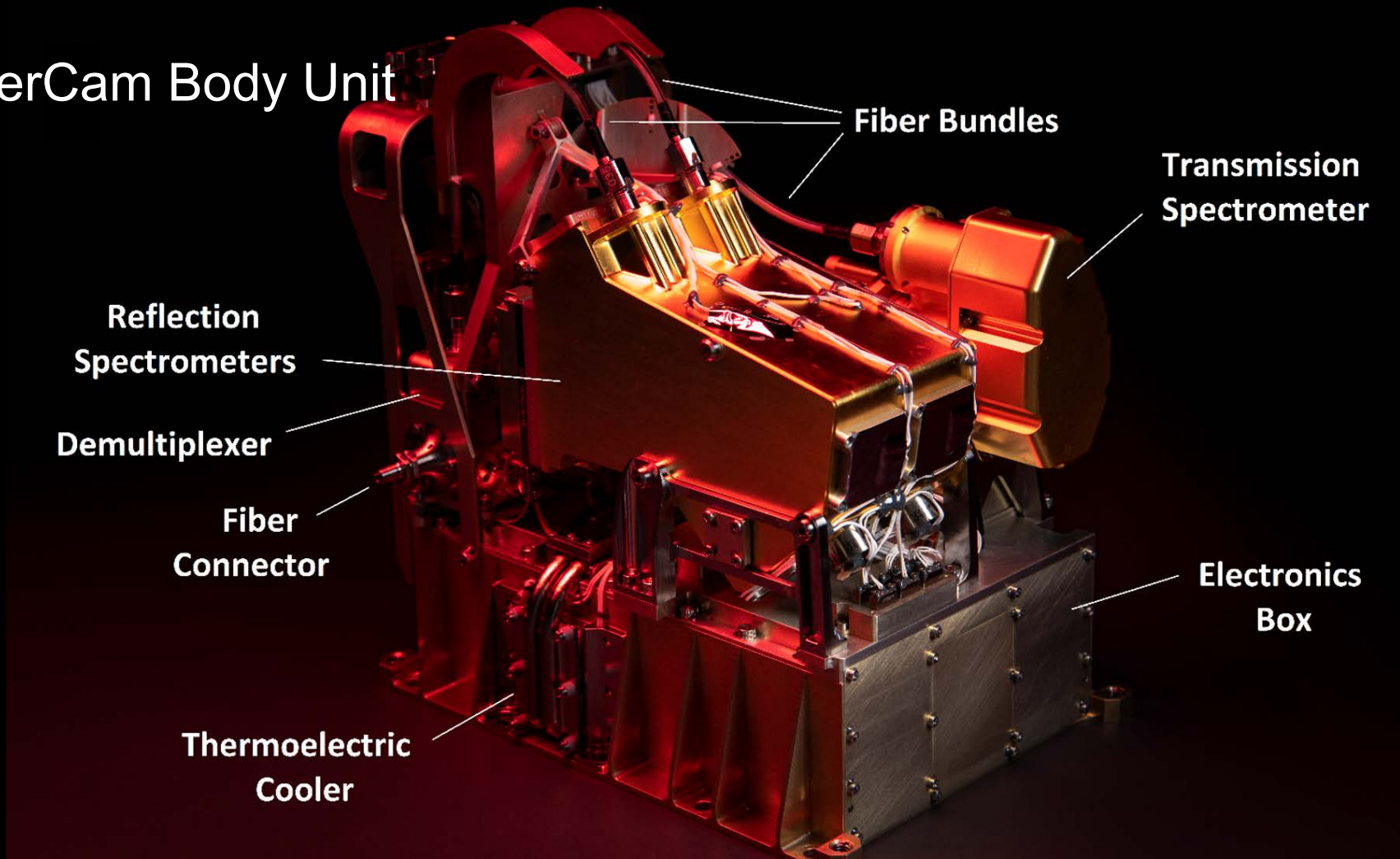


Time-Resolved Remote Green Raman Spectroscopy

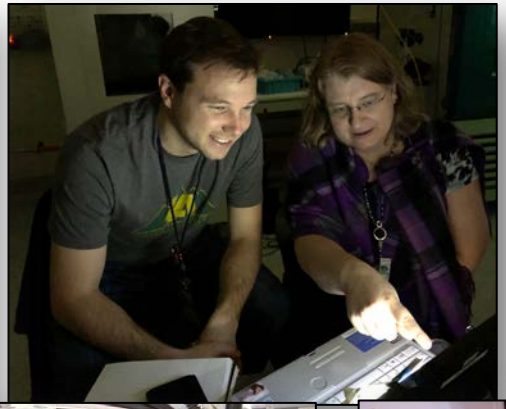
SuperCam Mast Unit

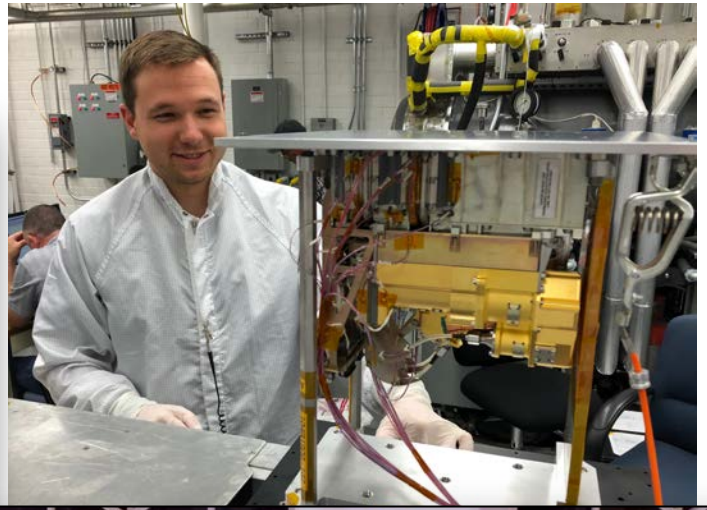


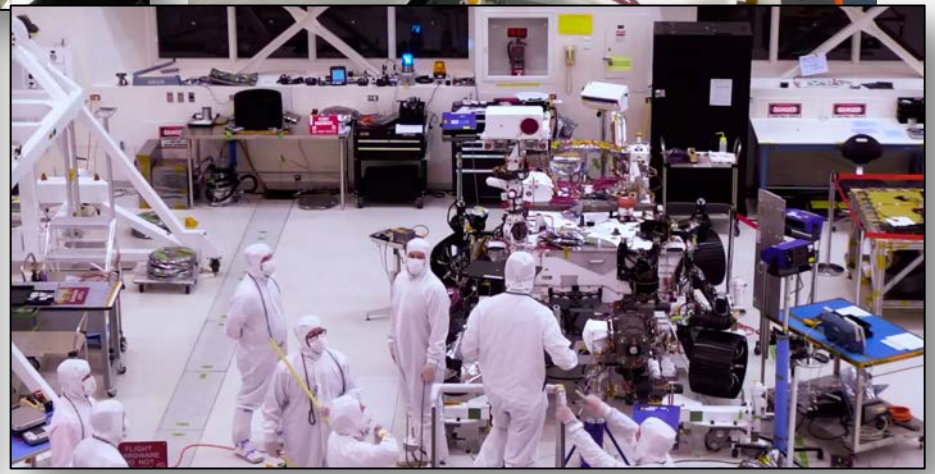
SuperCam Body Unit



Design to delivery



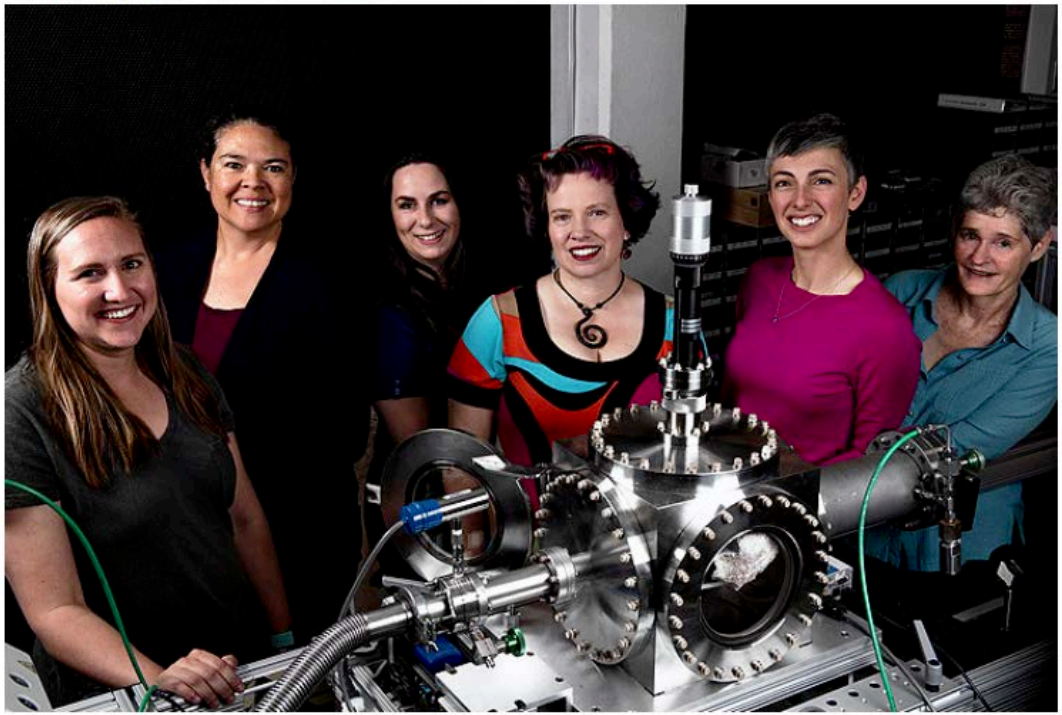




All-woman team commands rock-zapping laser on Mars

The team is responsible for sending commands to the ChemCam instrument, which shoots Martian rocks with a laser to determine their chemical make-up

June 10, 2019



Members of Los Alamos National Laboratory's ChemCam Engineering Operations team. From left to right: Suzi Montano, Adriana Reyes-Newell, Roberta Beal, Lisa Danielson, Nina Lanza, and Cindy Little (not pictured: Margie Root).

ISR-1 & ISR-2

Physicists
Nuclear engineers
Planetary scientists
Etc

ISR-3

Computer scientists
Software engineers
Data scientists

ISR-4

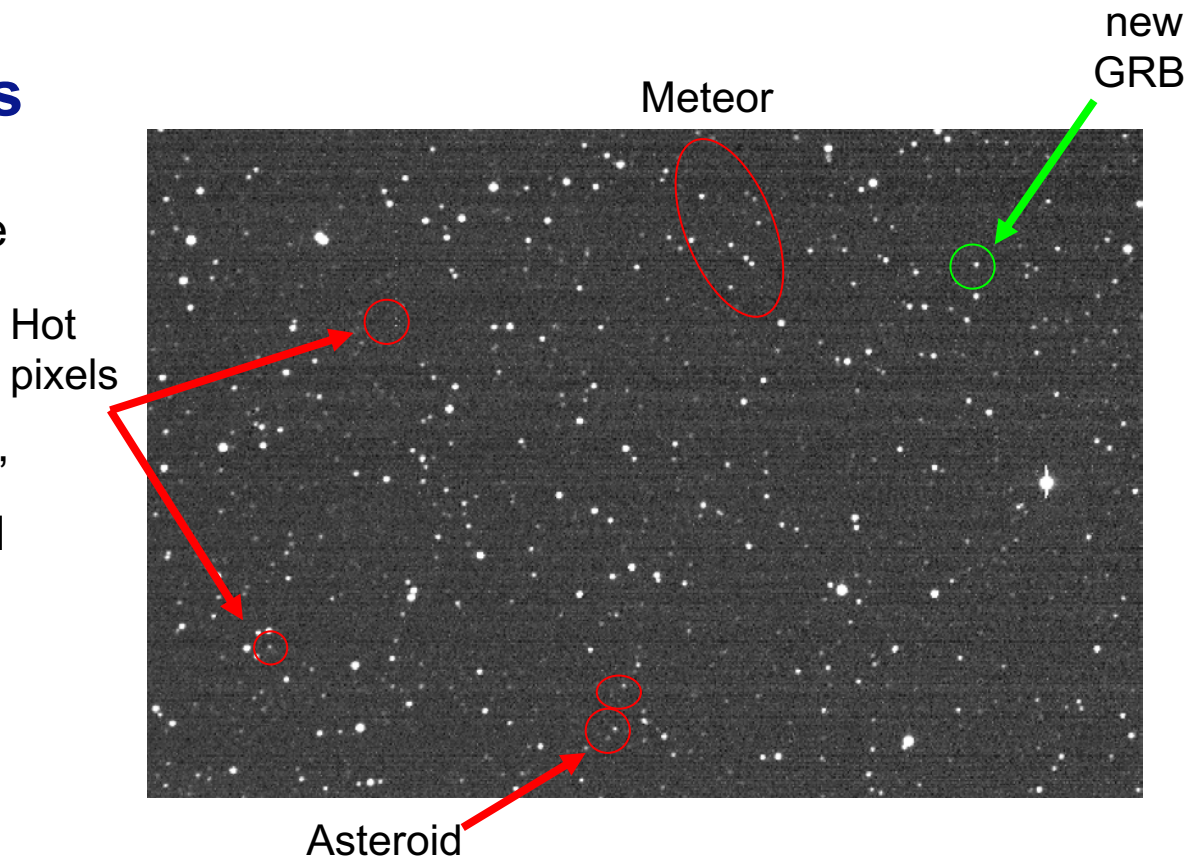
Electrical engineers
Computer engineers

ISR-5

Mechanical engineers
Systems engineers
Technicians
Project controls

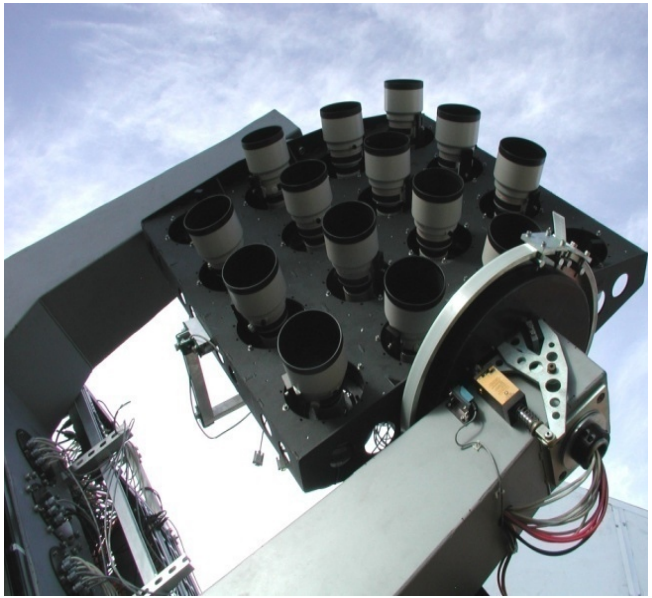
Thinking Telescopes

- Problem: current telescope systems make 1 billion observations per night
- Solution: autonomous robotic systems that “think” and respond to data in real time
- Automatic detection and follow-up for astrophysical transients like gamma ray bursts



Thinking Telescopes

Full-sky persistence



Full-sky scan

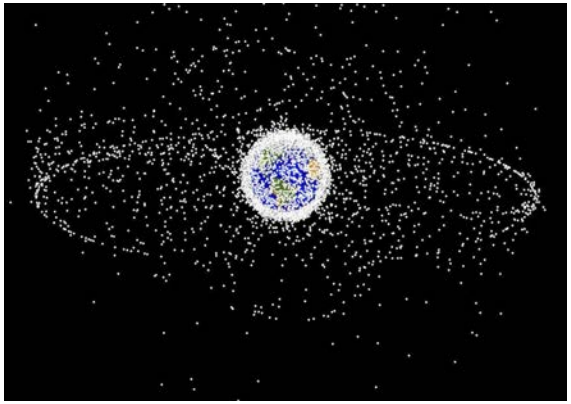
Interesting event cues

Thinking Telescopes

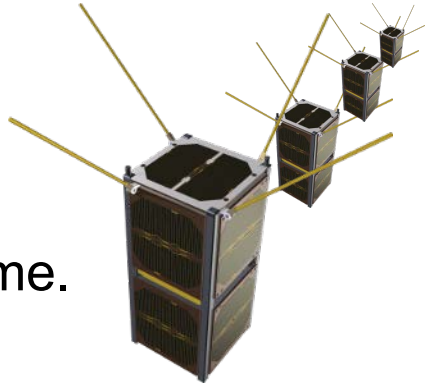
Interesting event cues

Follow up with bigger, NFOV telescopes

ELROI satellite license plate



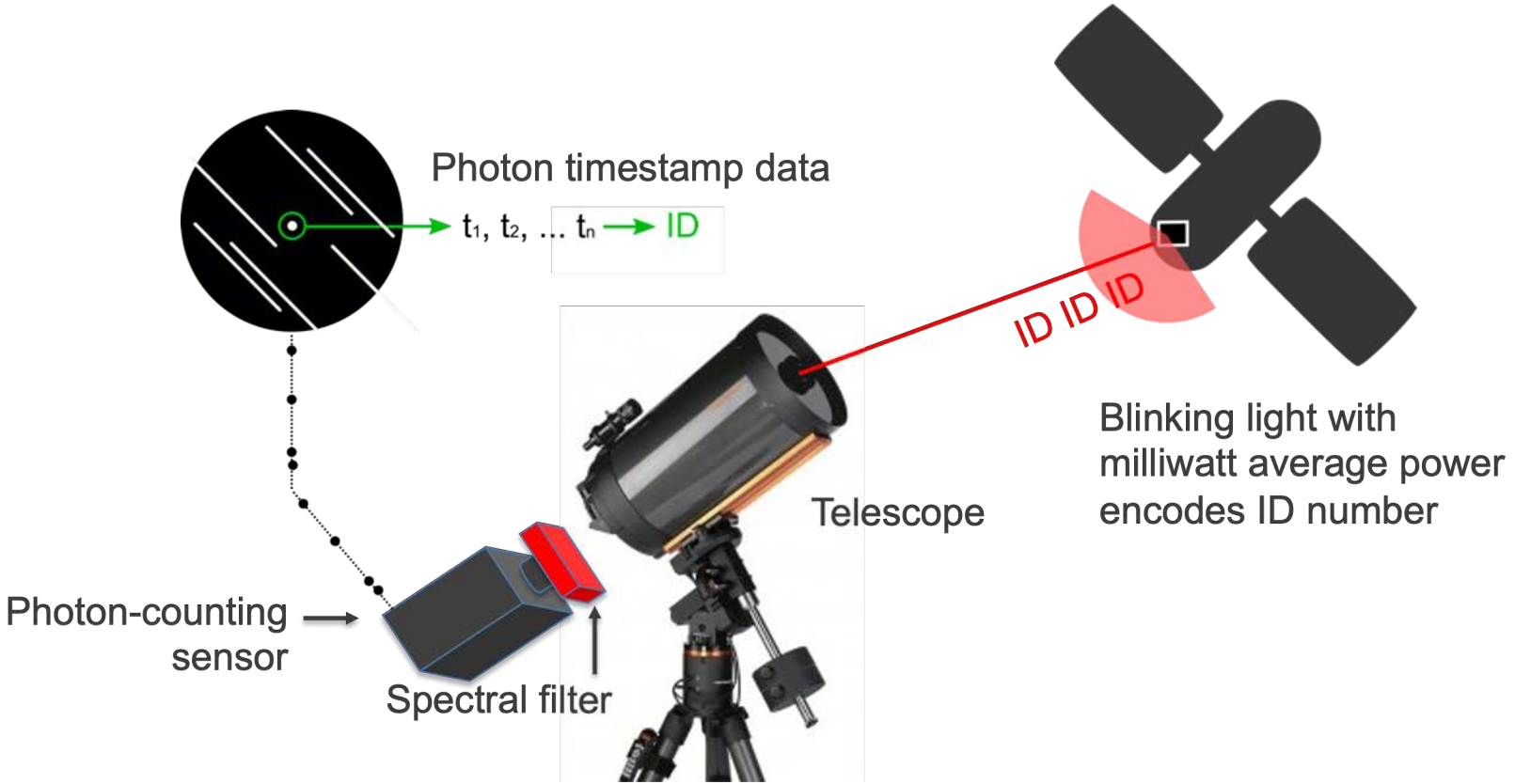
19,000+ space objects are tracked today.



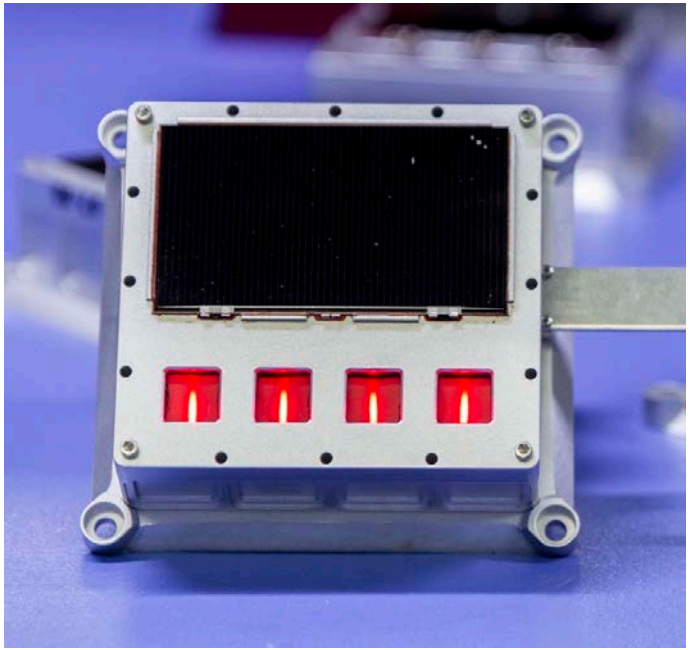
CubeSats are being launched 100+ at a time.
Which one is yours?

Satellites need a “license plate” that anyone can read from the ground.

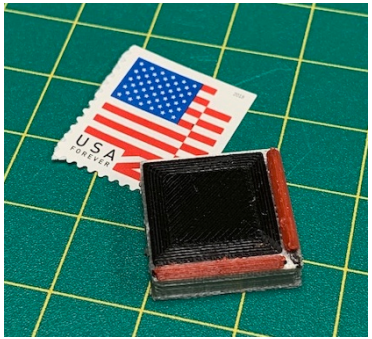
ELROI satellite license plate



ELROI satellite license plate



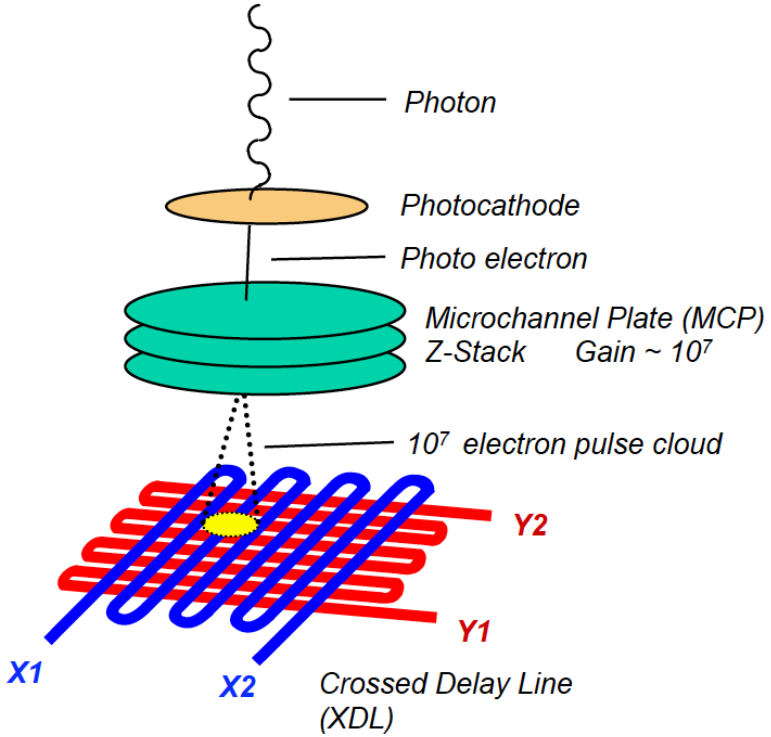
Current size



Final size

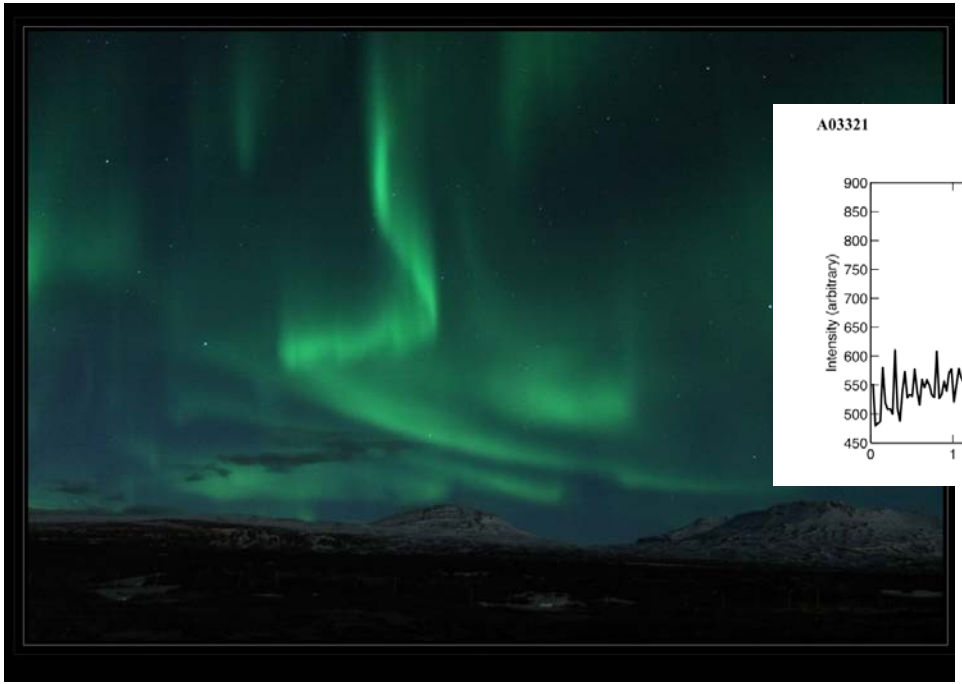
NCam single-photon camera

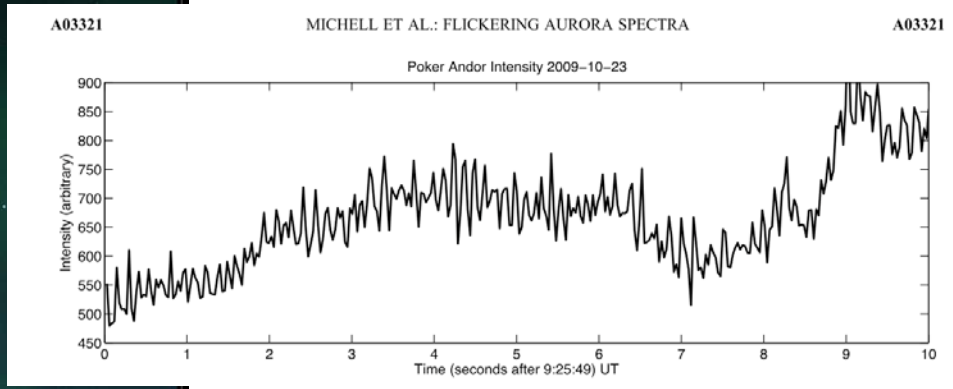
- Images built up one photon at a time
- Single-photon sensitivity with high time resolution (<1 ns) and very low noise
- Large format imaging



Aurora research with NCam

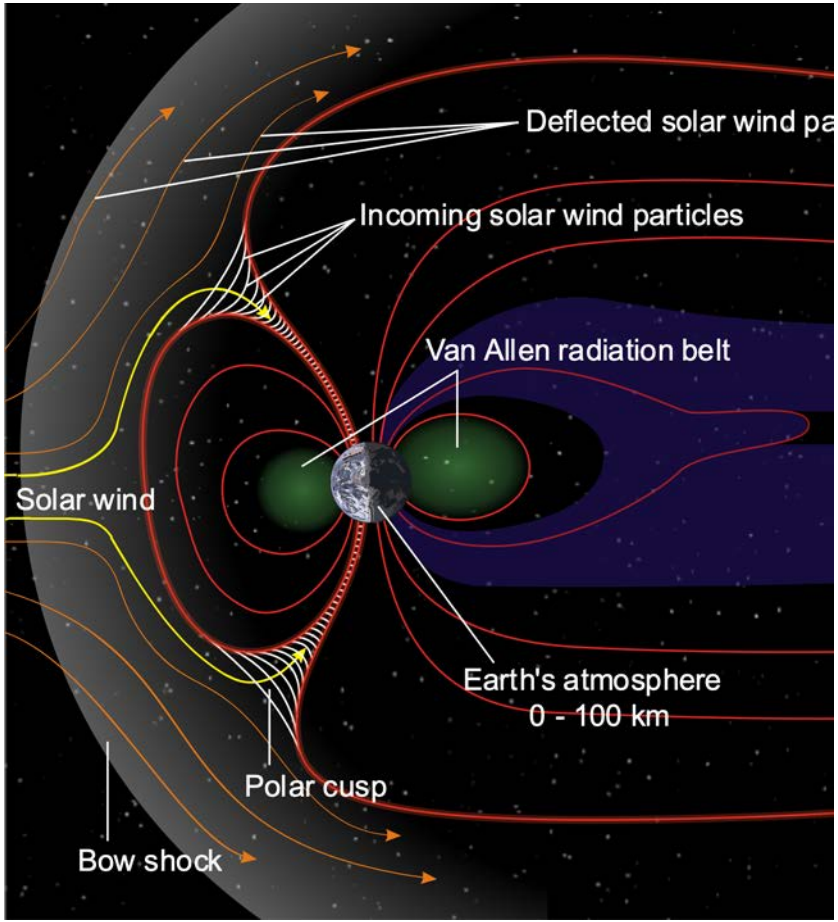
Aurora is dim and hard to study without long exposures





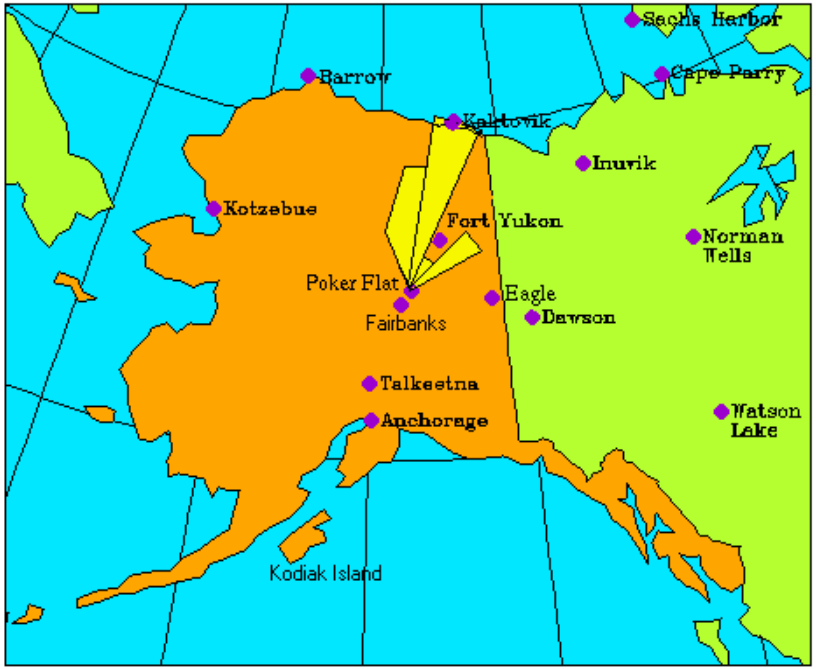
Observe with NCam – find new faster behavior?

Aurora research with NCam



Aurora oscillations can be linked to Earth's magnetic field

Aurora research with NCam



Rocket launch and aurora at Poker Flat Research Range

Outline

1. Very short history of Los Alamos National Laboratory (2 slides)
2. Very short overview of what LANL does today (3 slides)
3. Space research at LANL
4. **Why LANL is a great place to be a postdoc***
5. Why Los Alamos is a great place to live*

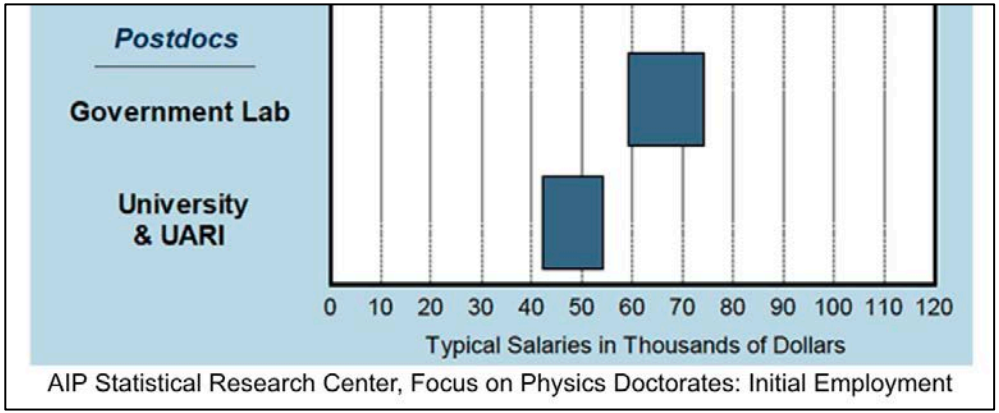
* My opinions

LANL is a great place to be a postdoc

- Exciting research
- World-class mentors and colleagues
- Learn new things, lots of variety
- Opportunity to get a security clearance and do classified work
- Path to a permanent position if you like it here
- Treated as a valued colleague and team member
- ISR Early Career Group organizes social activities and professional development

LANL is a great place to be a postdoc

- Better pay compared to universities
- Great benefits - same as LANL staff
- Work/life balance
- Flexible work schedules (alternate Fridays off, 4/10s, etc)
- Dual-career support



AIP Statistical Research Center, Focus on Physics Doctorates: Initial Employment

Total Employees

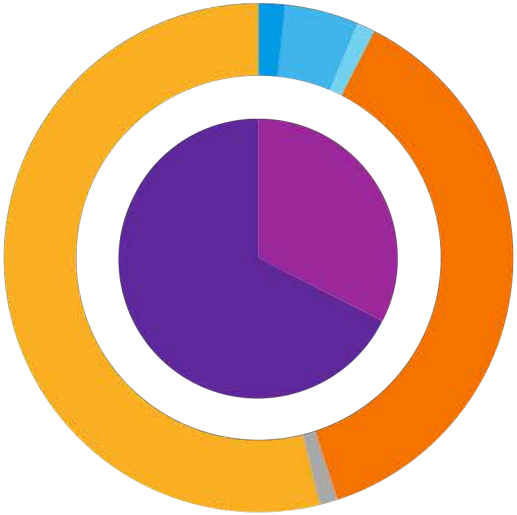
12,304

Female

32.4%

Male

67.6 %



1.8%	American Indian, Alaskan Native, Native Hawaiian, or Other Pacific Islander
5.3%	Asian
1.4%	Black or African American
37.8%	Hispanic or Latino
1.4%	Two or more races
52.1%	White

Types of jobs	% Women	% URM	% OPC
Senior Leadership Director/President, Deputy Director/Vice President, Associate Lab Director	28.57%	10.20%	0.00%
Research/Technical Management **(First-line and Mid-level)** Engineering Management, Research Management, Technical Management	23.71%	12.37%	5.84%
Operations (or Research Support) Management Business Management, Computer Systems, Communications, ESHQ, Facilities Ops, HR, Legal, Tech Transfer, Strategic Planning	29.68%	39.70%	1.11%
Technical Research Staff Non-management: Researchers, Scientists, or Engineers	23.33%	15.62%	7.90%
Operations Support Staff Non-management: Support Roles	42.29%	52.76%	1.95%
Post Doctoral (Post-doc employees)	24.85%	6.78%	36.76%
Graduate Students (Funded by Lab)	37.34%	24.40%	14.79%
Undergraduate Students (Funded by Lab, do not include undergrad student funded by DOE directly (i.e. SULI))	44.92%	43.58%	6.68%

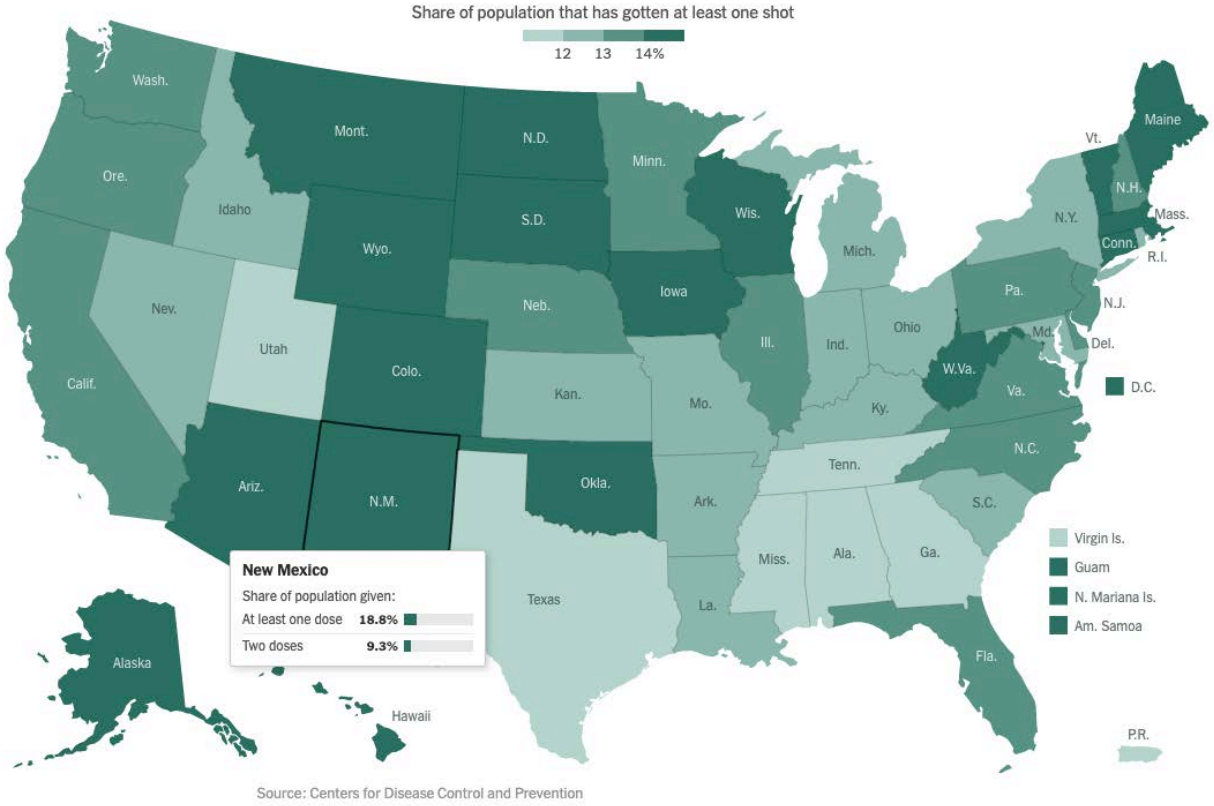
What you may not like

- Rules
- More rules

What is LANL like during the pandemic?

- “Normal operations with maximized telework”
- Translation: work at home as much as you can, come on site when you need to
- Vaccinations are happening

New Mexico is #2 in vaccination rates

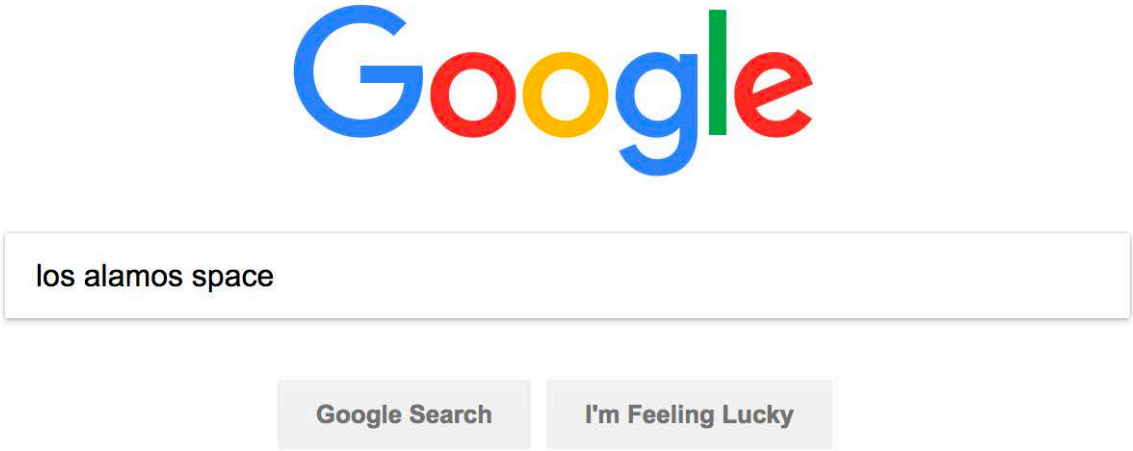


New York Times
2/22/2021

Los Alamos NATIONAL LABORATORY

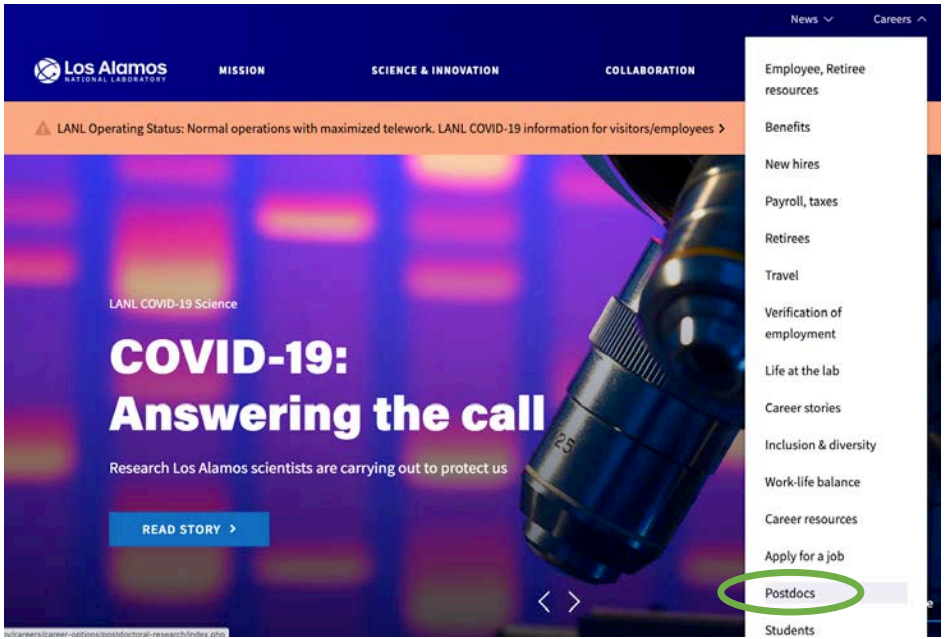
Industry	National Labs	Academia
More applied Profit-driven	“Science in the national interest”	More basic science Exploration-driven Publication-driven

How I found a postdoc position



Postdoc program and hiring process

- Postdoc appointments are 2 years with option to extend to 3 years
- Fellowships are available
- You are eligible if you earned your PhD within the last 5 years



Postdoc program and hiring process

- Search for postdoc jobs at **jobs.lanl.gov**
- Network through collaborators, conferences, etc
- Send your CV to people who might be interested (we pass these around!)
- Read application instructions carefully

What I look for in a postdoc

- Useful skills AND potential to learn new things
- Demonstrated scientific excellence (conferences, publications, recommendation letters)
- Maturity, professionalism, ability to work on a team, self-directed
- Interest in LANL mission or excitement about LANL

Outline

1. Very short history of Los Alamos National Laboratory (2 slides)
2. Very short overview of what LANL does today (3 slides)
3. Space research at LANL
4. Why LANL is a great place to be a postdoc*
5. **Why Los Alamos is a great place to live***

* My opinions

New Mexico

- About 2,000,000 residents
- Most PhDs per capita (as of a 2000 study)
- Also ~20% poverty

New Mexico

Life in Los Alamos

Life in Los Alamos

- Small town living (~17,000 people)
- 7,355 feet above sea level
- Mild four-season climate: hot summers, cold winters
- Surrounded by National Forest, National Park, Pueblo, and other Federal lands
- Excellent public schools
- No restaurants open after 8 PM (okay probably a few)
- One brewery
- 90 miles from Albuquerque, 35 miles from Santa Fe, 55 miles from Taos
- Housing market is challenging

Other commuting options: 35-55 minutes

Santa Fe

Jemez mountains
and other nearby communities

Other commuting options

Employee Spotlight: Jocelyn Buckley

November 27, 2018

Life in Los Alamos

Life in Los Alamos

America's Healthiest Community: Los Alamos County

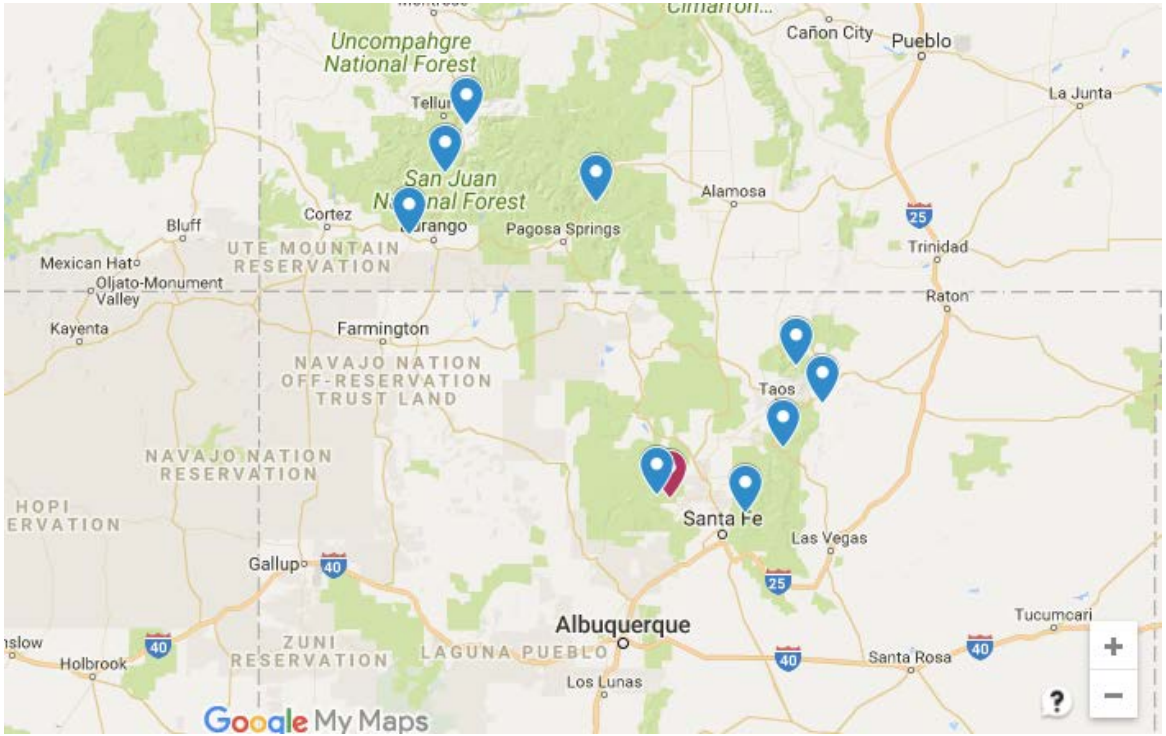
Home to a once-secret site for scientific research, the New Mexico county is No. 1 in U.S. News' third annual Healthiest Communities rankings.

By **Gaby Galvin**, Staff Writer Sept. 22, 2020

Outdoor recreation

- Hiking
- Camping
- Rock climbing
- Mountain biking
- Hunting and fishing
- Rafting
- Skiing/snowboarding

Outdoor recreation: skiing




Contact me: rmholmes@lanl.gov